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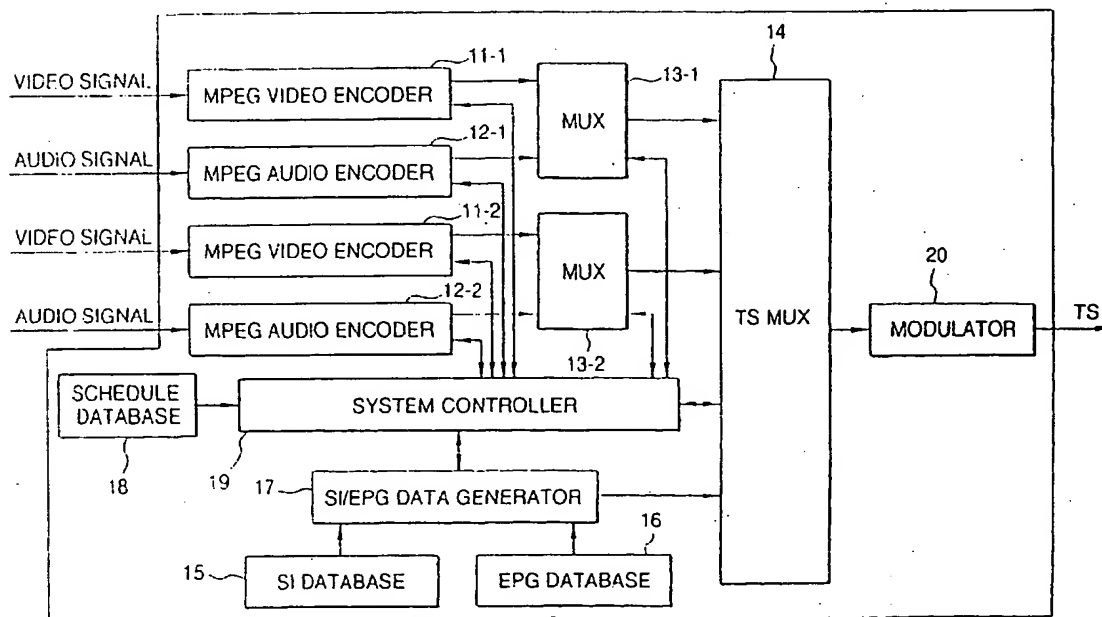
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(54) Information transmitting apparatus and method, information receiving apparatus and method, apparatus for providing a computer readable program, and broadcasting system

(57) MPEG video encoders and MPEG audio encoders encode video signals and audio signals, respectively. An SI/EPG data generator generates program in-

formation. A transport stream multiplexer multiplexes the program information with video data and audio data. A system controller controls the data output rates of the encoding operations and the multiplexing ratio.

FIG. 3



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Description

[0001] The present invention relates to an information transmitting apparatus and method, an information receiving apparatus and method, a provider, and a broadcasting system.

[0002] In digital broadcasting systems, EPG (electronic program guide) data for providing program information is formed in an EIT (event information table) format according to the rules of DVB/SI (Digital Video Broadcasting/Service Information: EN300468) and multiplexed with other services information (SI) into a transport stream.

[0003] Fig. 1 is a table showing an example of the EIT in which the total transmission rate of EPG information is set at 150 kbps. The EIT consists of a network ID, a TS-ID, a service ID, table IDs, program broadcast hours corresponding to the table IDs, program lengths corresponding to the table IDs, and other data. Further, a program title, genre information, etc. can be described in descriptors together with a broadcast start hour and a program length.

[0004] The EIT generally consists of EPG data of the self station and EPG data of other stations, each of which consists of data of current and next programs, data of programs within 6 hours from the present time, data of programs that are 6-24 hours away, data of programs that are 2-3 days away, and data of programs that are 4-8 days away. The data of programs within 6 hours from the present time, the data of programs that are 6-24 hours away, the data of programs that are 2-3 days away, and the data of programs that are 4-8 days away are generically called schedule EPG data that indicates a program broadcast schedule. Each of those EPG data has its own Table_id (Table_identification code) and a re-transmission cycle. EPG data are transmitted at re-transmission cycles that are set for the respective Table_id data and have respective prescribed transmission rates. The EPG data of current and next programs has a relatively short re-transmission cycle of about several seconds. On the other hand, the schedule EPG data indicating a program broadcast schedule has a re-transmission cycle of about several minutes, which is longer than the re-transmission cycle of the EPG data of current and next programs.

[0005] As shown in Fig. 2, as for the transmission of EPG data, a prescribed EPG data (including prescribed services information) occupation bandwidth is set for the transmission channel bandwidth of a digital broadcasting system. Since priority is given to the transmission of video data and audio data, the EPG data occupation bandwidth does not vary even if a free portion occurs in the occupation bandwidth for the transmission of video data or the occupation bandwidth for the transmission of audio data.

[0006] A viewer takes long time to acquire program information when the data amount of EPG data is large, because EPG data is transmitted to an information re-

ceiving apparatus at a constant transmission rate even if a free portion occurs in the occupation bandwidths for the transmission of video data and audio data.

[0007] Further, since schedule EPG data indicating program broadcast schedules has long re-transmission cycles and there is no data indicating their transmission statuses, an information receiving apparatus takes long time to judge the state of the transmission side when the transmission of the schedule EPG data is suspended due to the equipment trouble on the transmission side.

[0008] Various respective aspects and features of the invention are defined in the appended claims.

[0009] Embodiments of the invention can provide an information transmitting apparatus and method, an information receiving apparatus and method, a provider, and a broadcasting system in which the transmission amount of data of program information can be increased when the transmission amounts of video data and audio data can be decreased, and/or an information transmitting apparatus and method, an information receiving apparatus and method, a provider, and a broadcasting system in which the information receiving apparatus can recognize, in a short time, the transmission statuses of schedule EPG data that indicate program broadcast schedules of the transmission side.

[0010] Embodiments of the invention enable acquisition of program information in a short time by increasing the transmission amount of data of program information when the transmission amounts of video data and audio data can be decreased.

[0011] Embodiments of the invention allow an information receiving apparatus to recognize, in a short time, the transmission statuses of schedule EPG data that indicate program broadcast schedules of the transmission side.

[0012] An information transmitting apparatus according to embodiments of the invention comprising multiplexing means for multiplexing a plurality of signals; and control means for controlling a multiplexing ratio among the plurality of signals in the multiplexing means.

[0013] An information transmitting method according to the embodiments of the invention comprises a multiplexing step of multiplexing a plurality of signals; and a control step of controlling a multiplexing ratio among the plurality of signals in the multiplexing step.

[0014] A provider according to embodiments of the invention provides a computer-readable program or medium for causing an information transmitting apparatus to execute a process comprising: a multiplexing step of multiplexing a plurality of signals; and a control step of controlling a multiplexing ratio among the plurality of signals in the multiplexing step.

[0015] An information receiving apparatus according to embodiments of the invention comprises separating means for separating program information that is multiplexed with a video signal and an audio signal; storing means for storing the program information separated by the separating means; and control means for controlling

operations of the separating means and the storing means in accordance with a transmission rate of the program information.

[0016] An information receiving method according to embodiments of the invention comprises a separating step of separating program information that is multiplexed with a video signal and an audio signal; a storing step of storing the program information separated by the separating means; and a control step of controlling operations of the separating step and the storing step in accordance with a transmission rate of the program information.

[0017] A provider according to another embodiment of the invention provides a computer-readable program or medium for causing an information receiving apparatus to execute a process comprising a separating step of separating program information that is multiplexed with a video signal and an audio signal; a storing step of storing the program information separated by the separating means; and a control step of controlling operations of the separating step and the storing step in accordance with a transmission rate of the program information.

[0018] A broadcasting system according to an embodiment of the invention is such that an information transmitting apparatus comprises video encoding means for encoding a video signal; audio encoding means for encoding an audio signal; program information data generating means for generating data of program information; multiplexing means for multiplexing the data of the program information that is output from the program information data generating means with video data that is output from the video encoding means and audio data that is output from the audio encoding means; and control means for controlling a data output rate of the video encoding means, a data output rate of the audio encoding means, a data output rate of the program information data generating means, and a multiplexing ratio among the video data, the audio data, and the data of the program information in the multiplexing means, and that an information receiving apparatus comprises separating means for separating the program information that is multiplexed with the video signal and the audio signal; storing means for storing the program information separated by the separating means; and control means for controlling operations of the separating means and the storing means in accordance with a transmission rate of the program information.

[0019] An information transmitting apparatus according to another embodiment of the invention comprises program information data generating means for generating program information data including information of a transmission status of program information; and multiplexing means for multiplexing the program information data generated by the program information data generating means with an encoded video signal and an encoded audio signal.

[0020] The invention will now be described by way of example with reference to the accompanying drawings, throughout which like parts are referred to by like references, and in which:

Fig. 1 is a table showing an example of EIT;
Fig. 2 shows how a video data occupation bandwidth, an audio data occupation bandwidth, and an EPG data occupation bandwidth vary with time in relation to a transmission channel bandwidth;
Fig. 3 is a block diagram showing the configuration of an information transmitting apparatus according to an embodiment of the present invention;
Fig. 4 is a table showing an EIT in which the total transmission rate of EPG information is set at 330 kbps;
Fig. 5 shows how a video data occupation bandwidth, an audio data occupation bandwidth, and an EPG data occupation bandwidth vary with time in relation to a transmission channel bandwidth in a case where the transmission rate of EPG data is increased at prescribed time points;
Fig. 6 is a flowchart showing a bandwidth allocation changing process of a system controller;
Fig. 7 is a block diagram showing the configuration of an information receiving apparatus according to an embodiment of the invention;
Fig. 8 is a flowchart showing the operation of an EPG data acquisition process of the information receiving apparatus;
Fig. 9 shows an EIT form that defines a description format of EPG data of current and next programs;
Fig. 10 shows a description of the transmission statuses of schedule EPG data that is made in a descriptor of EPG data of current and next programs and indicates program broadcast schedules;
Fig. 11 is a flowchart showing a process of the information transmitting apparatus for acquiring data of the transmission statuses of schedule EPG data indicating program broadcast schedules; and
Fig. 12 shows a form of a table information table that defines an SI description format.

[0021] Fig. 3 is a block diagram showing the configuration of an information transmitting apparatus according to an embodiment of the invention. The information processing apparatus 1 outputs a transport stream TS based on a plurality of video signals and audio signals that are input externally. An MPEG video encoder 11-1 generates a video elementary stream based on a video signal that is input externally and outputs it to a multiplexer 13-1. An MPEG video encoder 11-2 generates a video elementary stream based on a video signal that is input externally and outputs it to a multiplexer 13-2.
[0022] An MPEG audio encoder 12-1 generates an audio elementary stream based on an audio signal that is input externally and outputs it to the multiplexer 13-1. An MPEG audio encoder 12-2 generates an audio ele-

mentary stream based on an audio signal that is input externally and outputs it to the multiplexer 13-2.

[0023] The multiplexer 13-1 multiplexes a video elementary stream supplied from the MPEG video encoder 11-1 and an audio elementary stream supplied from the MPEG audio encoder 12-1 by incorporating those into packets having a prescribed fixed length, and outputs the packets to a transport stream multiplexer 14. The multiplexer 13-2 multiplexes a video elementary stream supplied from the MPEG video encoder 11-2 and an audio elementary stream supplied from the MPEG audio encoder 12-2 by incorporating those into packets having a prescribed fixed length, and outputs the packets to the transport stream multiplexer 14.

[0024] An SI database 15 supplies system information data stored therein to an SI/EPG data generator 17. An EPG database 16 supplies EPG data stored therein to the SI/EPG data generator 17. The SI/EPG data generator 17 incorporates data that are supplied from the SI database 15 and the EPG database 16 and data indicating the transmission statuses of schedule EPG data that indicate program broadcast schedules into packets of a prescribed fixed length and outputs the packets to the transport stream multiplexer 14.

[0025] A schedule database 18 supplies a system controller 19 with the contents, transmission rates, re-transmission cycles, etc. of video data, audio data, and EPG data, respectively, that will be transmitted from the information transmitting apparatus at each time point. Based on the data supplied from the schedule database 18, the system controller 19 manages the states of the MPEG video encoders 11-1 and 11-2 and the MPEG audio encoders 12-1 and 12-2 and controls the bit rates of video elementary streams that are output from the MPEG video encoders 11-1 and 11-2 and audio elementary streams that are output from the MPEG audio encoders 12-1 and 12-2. Further, the system controller 19 controls the amount of packets that are output from the SI/EPG data generator 17. Still further, the system controller 19 controls the multiplexers 13-1 and 13-2 and the transport stream multiplexer 14 to thereby control the video data occupation bandwidth, the audio data occupation bandwidth, and the EPG data occupation bandwidth in relation to the transmission channel bandwidth.

[0026] The transport stream multiplexer 14 multiplexes packets that are supplied from the multiplexers 13-1 and 13-2 and the SI/EPG data generator 17 and outputs a transport stream. A modulator 20 modulates a transport stream that is output from the transport stream multiplexer 14 according to a prescribed modulation scheme and outputs a modulated transport stream TS to, for example, an antenna (not shown) in the case of transmission by radio waves or to a prescribed interface in the case of transmission via a cable.

[0027] Fig. 4 is a table showing an EIT in which the total transmission rate of EPG information is set at 330 kbps. In the EIT shown in Fig. 4, the re-transmission cy-

cle of program information of other stations that are 6-24 hours away is set at 10 seconds that is 1/2 of that of the EIT shown in Fig. 1. The re-transmission cycle of program information of other stations that are 2-3 days away is set at 20 seconds that is 1/3 of that of the EIT shown in Fig. 1. The re-transmission cycle of program information of other stations that are 4-8 days away is set at 30 seconds that is 1/6 of that of the EIT shown in Fig. 1. Therefore, the transmission rate of program information of other stations that are 6-24 hours away in the EIT shown in Fig. 4 is set at 64 kbps, which is two times higher than in the EIT shown in Fig. 1. The transmission rate of program information of other stations that are 2-3 days away in the EIT shown in Fig. 4 is set at 60 kbps, which is three times higher than in the EIT shown in Fig. 1. The transmission rate of program information of other stations that are 4-8 days away in the EIT shown in Fig. 4 is set at 120 kbps, which is six times higher than in the EIT of Fig. 1. A wider transmission channel bandwidth is required to transmit EPG data according to the EIT shown in Fig. 4 than to transmit EPG data according to the EIT shown in Fig. 1.

[0028] Fig. 5 shows how a video data occupation bandwidth, an audio data occupation bandwidth, and EPG data occupation bandwidth vary with time in relation to a transmission channel bandwidth in a case where EPG data is transmitted according to the EIT of Fig. 4 in periods from time 0:00, 2:00, and 4:00 to prescribed time points and according to the EIT of Fig. 1 in the remaining periods. The EPG data occupation bandwidth is wider in the periods from time 0:00, 2:00, and 4:00 to the prescribed time points than in the remaining periods.

[0029] Conversely, the video data occupation bandwidth and the audio data occupation bandwidth are narrower in the periods from time 0:00, 2:00, and 4:00 to the prescribed time points than in the remaining periods. It is necessary to set the video data bit rate and the audio data bit rate lower in the periods from time 0:00, 2:00, and 4:00 to the prescribed time points than in the remaining periods.

[0030] Fig. 6 is a flowchart showing a bandwidth allocation changing process of the system controller 19. At step S11, the system controller 19 reads out, from the schedule database 18, data indicating current allocation of a video data occupation bandwidth, an audio data occupation bandwidth, and an EPG data occupation bandwidth. At step S12, by using the read-out data indicating the bandwidth allocation, the system controller 19 calculates video data transmission rates of the channels corresponding to the MPEG video encoders 11-1 and 11-2, audio data transmission rates of the channels corresponding to the MPEG audio encoders 12-1 and 12-2, and a transmission rate of EPG data.

[0031] At step S13, the system controller 19 sets, in each of the MPEG video encoders 11-1 and 11-2, the MPEG audio encoders 12-1 and 12-2, and the SI/EPG data generator 17, a transmission rate of packets that

are output therefrom. At step S14, the system controller 19 sets operations corresponding to the allocation of a video data occupation bandwidth, an audio data occupation bandwidth, and an EPG data occupation bandwidth in the multiplexers 13-1 and 13-2 and the transport stream multiplexer 14.

[0032] In the above-described manner, the information transmitting apparatus 1 can change the re-transmission cycle of EPG data at prescribed time points based on data that is set in the schedule database 18.

[0033] Fig. 7 is a block diagram showing an information receiving apparatus according to an embodiment of the invention. The information receiving apparatus 2 receives a transport stream that is supplied from a predetermined transmission channel and outputs a prescribed video signal and a prescribed audio signal based on a signal corresponding to a manipulation on a remote controller 3.

[0034] The remote controller 3 transmits a prescribed infrared signal to an infrared rays (Ir) receiver 39 of the information receiving apparatus 2 based on a manipulation such as a channel selection by the user of the information receiving apparatus 2. The Ir receiver 39 outputs to a system controller 38, prescribed data corresponding to an infrared signal transmitted from the remote controller 3. The system controller 38 supplies a demultiplexer 32 with PID (packet identification data) that is based on a channel selection manipulation by the user and supplies an EPG controller 35 with data indicating an operation that is based on a display manipulation by the user. The system controller 38 extracts data that is described in the descriptor of EPG data of current and next programs and indicates the transmission statuses of schedule EPG data that indicate program broadcast schedules.

[0035] A demodulator 31 demodulates a transport stream TS that has been modulated according to a prescribed scheme and supplies a demodulated transport stream to the demultiplexer 32. The demultiplexer 32 divides a transport stream, and supplies a video elementary stream obtained from packets having prescribed PID to a video encoder 33, an audio elementary stream obtained from packets having prescribed PID to an audio decoder 34, EPG data to the EPG controller 35, and SI data to the system controller 38.

[0036] The video decoder 33 decodes a received video elementary stream and outputs a video signal according to a prescribed scheme to a display controller 37. The audio decoder 34 decodes a received audio elementary stream and outputs an audio signal to the outside.

[0037] The EPG controller 35 stores EPG data that is supplied from the demultiplexer 32 in an EPG memory 36. The EPG controller 35 reads out data stored in the EPG memory 36 under the control of the system controller 38 and outputs the read-out data to the display controller 37 according to a prescribed scheme. The display controller 37 outputs a prescribed video signal to

the outside based on signals supplied from the video decoder 33 and the EPG controller 35.

[0038] Fig. 8 is a flowchart showing the operation of an EPG data acquisition process of the information receiving apparatus 2. At step S21, the system controller 38 judges whether there has occurred an EPG data acquisition request. If there has occurred an EPG data acquisition request, the process goes to step S22, where it is judged whether the setting of the system controller 38 by the user's manipulating the remote controller 3 is such that EPG data should be acquired only at the time of rate increase (the total transfer rate of EPG information is increased). If it is judged at step S22 that EPG data should be acquired only at the time of rate increase, the process goes to step S23, where the system controller 38 judges whether it has set data of a rate increase period in the EPG controller 35.

[0039] If it is judged at step S23 that no data of a rate increase period has been set in the EPG controller 35, the process goes to step S24, where the system controller 38 searches for data of an EPG data rate increase period that is included in SI data supplied from the demultiplexer 32. At step S25, the system controller 38 judges whether data of a rate increase period could be retrieved. If it is judged that data of a rate increase period could be retrieved, the process goes to step S27, where the system controller 38 sets the data of a rate increase period in the EPG controller 35 as data acquisition time. Then, the process goes to step S28.

[0040] If it is judged at step S25 that no data of a rate increase period could be retrieved, the system controller 38 sets default data acquisition time in the EPG controller 35. Then, the process goes to step S28.

[0041] At step S28, the EPG controller 35 judges whether the present time is the thus-set data acquisition time. If it is judged that the present time is the thus-set data acquisition time, the process goes to step S29, where EPG data is acquired and stored in the EPG memory 36.

[0042] If it is judged at step S28 that the present time is not the thus-set data acquisition time, the process is finished.

[0043] If it is judged at step S23 that data for a rate increase period has been set in the EPG controller 35, the process goes to step S28.

[0044] If it is judged at step S22 that EPG data should be acquired also at time other than the time of rate increase, the process goes to step S29, where EPG data is acquired and stored in the EPG memory 36.

[0045] If it is judged at step S21 that there has occurred no EPG data acquisition request, the process is finished.

[0046] As described above, the information receiving apparatus 2 can acquire EPG data only in rate increase periods. Periods when the total transmission rate of EPG information should be increased may be determined by management and the information receiving apparatus 2 may be caused to operate in accordance

with the management.

[0047] Fig. 9 shows an EIT form that defines a description format of EPG data of current and next programs. A table ID (table_id) on the second line of the EIT to a last table ID (last_table_id) on the 16th line are a header portion to be used for identification of this EIT. An event ID (event_id) on the 18th line and the following items are for description of transmission information relating to the current and next programs, and has a loop structure to allow repetitive description of transmission information relating to a plurality of programs. The transmission information relating to the current and next programs consists of program start hours, program lengths, and other information. Information relating to a program such as a program title or a genre of the program can be described in a descriptor on the 25th line.

[0048] Fig. 10 shows a description of the transmission statuses of schedule EPG data that are described in the descriptor of EPG data of current and next programs and indicate program broadcast schedules. To describe the statuses of a plurality of schedule EPG data indicating program broadcast schedules, the second to sixth lines have a loop structure. A table ID (table_id) on the third line indicates an ID corresponding to schedule EPG data indicating a program broadcast schedule. A status flag (status_flag) on the fourth line indicates that the information transmitting apparatus 1 is transmitting schedule EPG data indicating the corresponding program broadcast schedule if it has a value "1," and indicates that the information transmitting apparatus 1 is not doing so if it has a value "0." A version number (version_number) on the fifth line indicates a value that allows the information receiving apparatus 2 to recognize whether the content is the same as in an already acquired descriptor.

[0049] As described above, by reading out the contents of the descriptor of EPG data of current and next programs, the information receiving apparatus 2 can recognize, at the re-transmission cycle of the EPG data of current and next programs, the transmission statuses of schedule EPG data indicating program broadcast schedules.

[0050] Fig. 11 is a flowchart showing a process of the information receiving apparatus 2 for acquiring data of the transmission statuses of schedule EPG data indicating program broadcast schedules. At step S11, the system controller 38 reads out the descriptor of EPG data of current and next programs. At step S12, the system controller 38 judges whether the descriptor of the EPG data of current and next programs includes data that indicates the transmission status of schedule EPG data indicating a program broadcast schedule. If it is judged that the descriptor of the EPG data of current and next programs includes data that indicates the transmission status of schedule EPG data indicating a program broadcast schedule, the process goes to step S13, where a table ID and a version number is read out.

[0051] At step S14, the system controller 38 judges

whether there exists already acquired data relating to the transmission status of schedule EPG data indicating a program broadcast schedule corresponding to the table ID that was read out at step S13. If it is judged that there exists already acquired data relating to the transmission status of schedule EPG data indicating a program broadcast schedule, the process goes to step S15. At step S15, the system controller 38 judges whether the version number has been updated by comparing the version number that is included in the already acquired data relating to the transmission status of schedule EPG data indicating a program broadcast schedule with the version number read out at step S13. If it is judged that the version number has been updated, the process goes to step S16, where the system controller 38 reads out the data of the transmission status of schedule EPG data indicating a program broadcast schedule and stores it in a prescribed register inside the system controller 38.

[0052] If it is judged at step S14 that there is no already acquired data relating to the transmission status of schedule EPG data indicating a program broadcast schedule, the process goes to step S16, where the system controller 38 reads out the data of the transmission status of schedule EPG data indicating a program broadcast schedule and stores it in a prescribed register inside the system controller 38.

[0053] If it is judged at step S15 that the version number has not been updated yet, the process goes to step S17.

[0054] At step S17, the system controller 38 judges whether there exists next data that indicates the transmission status of schedule EPG data indicating a program broadcast schedule. If it is judged that there exists next data that indicates a transmission status of schedule EPG data indicating a program broadcast schedule, the process returns to step S13 to repeat execution of step S13 and the following steps.

[0055] If it is judged at step S12 that the descriptor of the EPG data of current and next programs includes no data that indicates a transmission state of schedule EPG data indicating a program broadcast schedule, the process is finished. If it is judged at step S17 that there exists no next data that indicates a transmission state of schedule EPG data indicating a program broadcast schedule, the process is finished.

[0056] As described above, the information receiving apparatus 2 can recognize, at the re-transmission cycle of EPG data of current and next programs, the transmission statuses of schedule EPG data indicating latest program broadcast schedules by reading out the contents of the descriptor of the EPG data of current and next programs.

[0057] Fig. 12 shows a form of a table information table (TIT) that defines a description format of SI that indicates presence/absence of each piece of table information of an EIT or the like, a transmission cycle of EPG data, an updating date and time of EPG data, etc. The descriptions from a table ID (table_id) on the second line

of the TIT to a last table ID (last_table_id) on the 16th line represent a header portion to be used for identification of this TIT. A table ID (table_id) on the 18th line and the following items describe transmission information relating to an EIT and has a loop structure to enable repetitive description of transmission information relating to a plurality of EITs. The transmission information relating to an EIT consists of a re-transmission cycle of the EIT, last updating time, a transmission status of the EIT, etc.

[0058] By utilizing transmission information relating to EITs that is described in SI according to the above TIT description format, the information receiving apparatus 2 can recognize the transmission statuses of schedule EPG data indicating program broadcast schedules by executing a process equivalent to the one shown in Fig. 11.

[0059] As described above, the information receiving apparatus 2 can recognize, in a short time, the transmission statuses of schedule EPG data indicating transmission-side program broadcast schedules.

[0060] In this specification, the term "system" means the entire apparatus that consists of a plurality of apparatuses.

[0061] Not only recording media such as a magnetic disk, a CD-ROM, a solid-state memory but also communication media such as a network and a satellite can be used as a provider for providing a user with a computer program for execution of the above-described process.

Claims

1. An information transmitting apparatus which transmits a plurality of signals after multiplexing those, comprising:

multiplexing means for multiplexing the plurality of signals; and
control means for controlling a multiplexing ratio among the plurality of signals in the multiplexing means.

2. The information transmitting apparatus according to claim 1, wherein the transmitting apparatus transmits the plurality of signals as a single transport stream.

3. The information transmitting apparatus according to claim 1, further comprising database means for providing data that relates to transmission rates of the plurality of signals at each time point, wherein the control means controls the multiplexing ratio while referring to the database means.

4. The information transmitting apparatus according to claim 1, further comprising encoding means for one of the plurality of signals, wherein the control

means controls an output rate of the encoding means.

5. The information transmitting apparatus according to claim 1, wherein the plurality of signals are program information, a video signal, and an audio signal.

6. An information transmitting apparatus which transmits program information after multiplexing it with a video signal and an audio signal, comprising:

video encoding means for encoding the video signal;

audio encoding means for encoding the audio signal;

program information data generating means for generating data of the program information;

multiplexing means for multiplexing the data of the program information that is output from the program information data generating means

with video data that is output from the video encoding means and audio data that is output from the audio encoding means; and

control means for controlling a data output rate of the video encoding means, a data output rate of the audio encoding means, a data output rate of the program information data generating means, and a multiplexing ratio among the video data, the audio data, and the data of the program information in the multiplexing means.

7. An information transmitting method for transmitting a plurality of signals after multiplexing those, comprising:

a multiplexing step of multiplexing the plurality of signals; and

a control step of controlling a multiplexing ratio among the plurality of signals in the multiplexing step.

8. The information transmitting method according to claim 7, wherein the control step controls the multiplexing ratio while referring to data that relates to transmission rates of the plurality of signals at each time point.

9. The information transmitting method according to claim 7, wherein the plurality of signals are program information, a video signal, and an audio signal.

10. An information transmitting method for transmitting program information after multiplexing it with a video signal and an audio signal, characterized by comprising:

a video encoding step of encoding the video

- signal;
 an audio encoding step of encoding the audio signal;
 a program information data generating step of generating data of the program information;
 a multiplexing step of multiplexing the data of the program information that is output by the program information data generating step with video data that is output by the video encoding step and audio data that is output by the audio encoding step; and
 a control step of controlling a data output rate of the video encoding step, a data output rate of the audio encoding step, a data output rate of the program information data generating step, and a multiplexing ratio among the video data, the audio data, and the data of the program information in the multiplexing step.
11. A provider for providing a computer-readable program for causing an information transmitting apparatus which transmits a plurality of signals after multiplexing those to execute a process comprising:
- a multiplexing step of multiplexing the plurality of signals; and
 - a control step of controlling a multiplexing ratio among the plurality of signals in the multiplexing step
12. The provider according to claim 11, wherein the control step controls the multiplexing ratio while referring to data that relates to transmission rates of the plurality of signals at each time point.
13. The provider according to claim 11, wherein the plurality of signals are program information, a video signal and an audio signal.
14. A provider for providing a computer-readable program for causing an information transmitting apparatus which transmits program information after multiplexing it with a video signal and an audio signal to execute a process comprising:
- a video encoding step of encoding the video signal;
 - an audio encoding step of encoding the audio signal;
 - a program information data generating step of generating data of the program information;
 - a multiplexing step of multiplexing the data of the program information that is output by the program information data generating step with video data that is output by the video encoding step and audio data that is output by the audio encoding step; and
 - a control step of controlling a data output rate
- of the video encoding step, a data output rate of the audio encoding step, a data output rate of the program information data generating step, and a multiplexing ratio among the video data, the audio data, and the data of the program information in the multiplexing step.
15. An information receiving apparatus which receive program information that is multiplexed with a video signal and an audio signal and displays the program information together with the video signal, comprising:
- separating means for separating the program information that is multiplexed with the video signal and the audio signal;
 - storing means for storing the program information separated by the separating means;
 - control means for controlling operations of the separating means and the storing means in accordance with a transmission rate of the program information.
16. The information receiving apparatus according to claim 15, wherein the control means controls the operations of the separating means and the storing means so that the program information is acquired only in a prescribed period when the transmission rate of the program information is high.
17. An information receiving method for receiving program information that is multiplexed with a video signal and an audio signal and displaying the program information together with the video signal, comprising:
- a separating step of separating the program information that is multiplexed with the video signal and the audio signal;
 - a storing step of storing the program information separated by the separating means; and
 - a control step of controlling operations of the separating step and the storing step in accordance with a transmission rate of the program information.
18. The information receiving method according to claim 17, wherein the control step controls the operations of the separating means and the storing means so that the program information is acquired only in a prescribed period when the transmission rate of the program information is high.
19. A provider for providing a computer-readable program for causing an information receiving apparatus which receives program information that is multiplexed with a video signal and an audio signal and displays the program information together with the

video signal to execute a process comprising:

a separating step of separating the program information that is multiplexed with the video signal and the audio signal;
 a storing step of storing the program information separated by the separating means; and
 a control step of controlling operations of the separating step and the storing step in accordance with a transmission rate of the program information.

20. The provider according to claim 19, wherein the control step controls the operations of the separating means and the storing means so that the program information is acquired only in a prescribed period when the transmission rate of the program information is high.

21. A broadcasting system having an information transmitting apparatus which transmits program information after multiplexing it with a video signal and an audio signal and an information receiving apparatus which receives the program information that is multiplexed with the video signal and the audio signal and displays the program information together with the video signal, the information transmitting apparatus comprising:

video encoding means for encoding the video signal;

audio encoding means for encoding the audio signal;

program information data generating means for generating data of the program information;

multiplexing means for multiplexing the data of the program information that is output from the program information data generating means with video data that is output from the video encoding means and audio data that is output from the audio encoding means; and

control means for controlling a data output rate of the video encoding means, a data output rate of the audio encoding means, a data output rate of the program information data generating means, and a multiplexing ratio among the video data, the audio data, and the data of the program information in the multiplexing means, and the information receiving apparatus comprising:

separating means for separating the program information that is multiplexed with the video signal and the audio signal;

storing means for storing the program information separated by the separating means; and

control means for controlling operations of the separating means and the storing means in accordance with a transmission rate of the pro-

gram information.

22. An information transmitting apparatus which transmits program information after multiplexing it with a video signal and an audio signal, comprising:

program information data generating means for generating program information data including information of a transmission status of the program information; and

multiplexing means for multiplexing the program information data generated by the program information data generating means with an encoded version of the video signal and an encoded version of the audio signal.

23. An information transmitting method for transmitting program information after multiplexing it with a video signal and an audio signal, comprising:

a program information data generating step of generating program information data including information of a transmission status of the program information; and

a multiplexing step of multiplexing the program information data generated by the program information data generating means with an encoded version of the video signal and an encoded version of the audio signal.

24. A provider for providing a computer-readable program for causing an information transmitting apparatus which transmits program information after multiplexing it with a video signal and an audio signal to execute a process comprising:

a program information data generating step of generating program information data including information of a transmission status of the program information; and

a multiplexing step of multiplexing the program information data generated in the program information data generating means with an encoded version of the video signal and an encoded version of the audio signal.

25. An information receiving apparatus which receives program information that is multiplexed with a video signal and an audio signal and displays the program information together with the video signal, comprising:

separating means for separating program information data that is multiplexed with the video signal and the audio signal; and

extracting means for extracting information of a transmission status of the program information that is included in the program information

data separated by the separating means.

26. An information receiving method for receiving program information that is multiplexed with a video signal and an audio signal and displaying the program information together with the video signal, comprising: 5

a separating step of separating program information data that is multiplexed with the video signal and the audio signal; and 10
an extracting step of extracting information of a transmission status of the program information that is included in the program information data separated by the separating means. 15

27. A provider for providing a computer-readable program for causing an information receiving apparatus which receives program information that is multiplexed with a video signal and an audio signal and displays the program information together with the video signal to execute a process comprising: 20

a separating step of separating program information data that is multiplexed with the video signal and the audio signal; and 25
an extracting step of extracting information of a transmission status of the program information that is included in the program information data separated by the separating means. 30

28. A broadcasting system having an information transmitting apparatus which transmits program information after multiplexing it with a video signal and an audio signal and an information receiving apparatus which receives the program information that is multiplexed with the video signal and the audio signal and displays the program information together with the video signal, the information transmitting apparatus comprising: 35
40

program information data generating means for generating program information data including information of a transmission status of the program information; and 45
multiplexing means for multiplexing the program information data generated by the program information data generating means with an encoded version of the video signal and an encoded version of the audio signal, and the information receiving apparatus comprising: 50
separating means for separating the program information data that is multiplexed with the video signal and the audio signal; and
extracting means for extracting information of a transmission status of the program information that is included in the program information data separated by the separating means. 55

FIG. 1

KIND OF PROGRAM INFORMATION (EIT)		Table_id	RE-TRANSMISSION CYCLE (sec)	TRANSMISSION RATE (kbps)
PROGRAM INFORMATION OF SELF STATION	CURRENT, NEXT	0x4E	3	1
	WITHIN 6 HOURS FROM PRESENT TIME	0x50	5	5
	6-24 HOURS AWAY	0x51	10	10
	2-3 DAYS AWAY	0x52	20	10
	4-8 DAYS AWAY	0x53	60	10
PROGRAM INFORMATION OF ANOTHER STATION	CURRENT, NEXT	0x4F	3	10
	WITHIN 6 HOURS FROM PRESENT TIME	0x60	5	32
	6-24 HOURS AWAY	0x61	20	32
	2-3 DAYS AWAY	0x62	60	20
	4-8 DAYS AWAY	0x63	180	20
TOTAL				150

FIG. 2

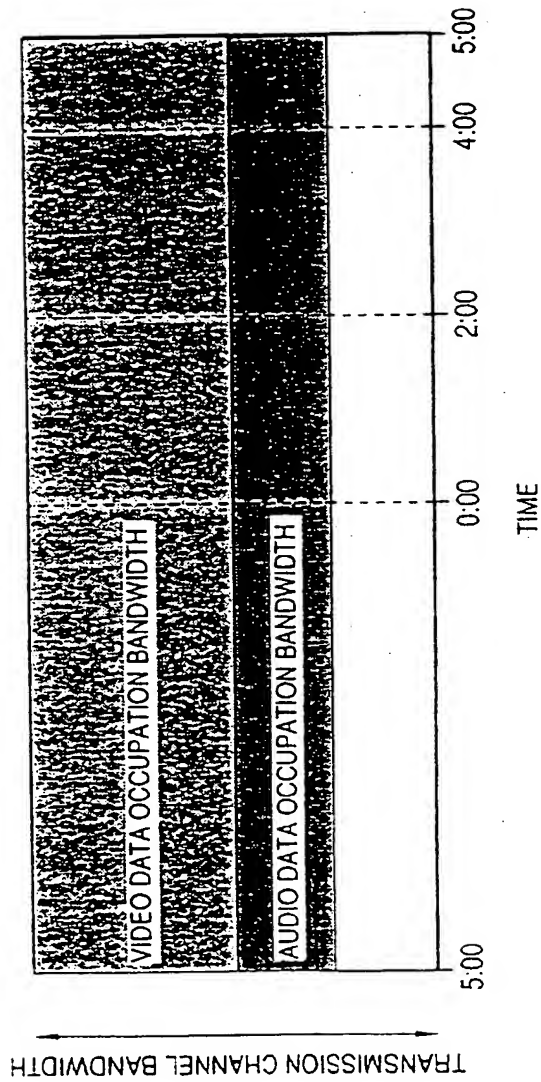


FIG. 3

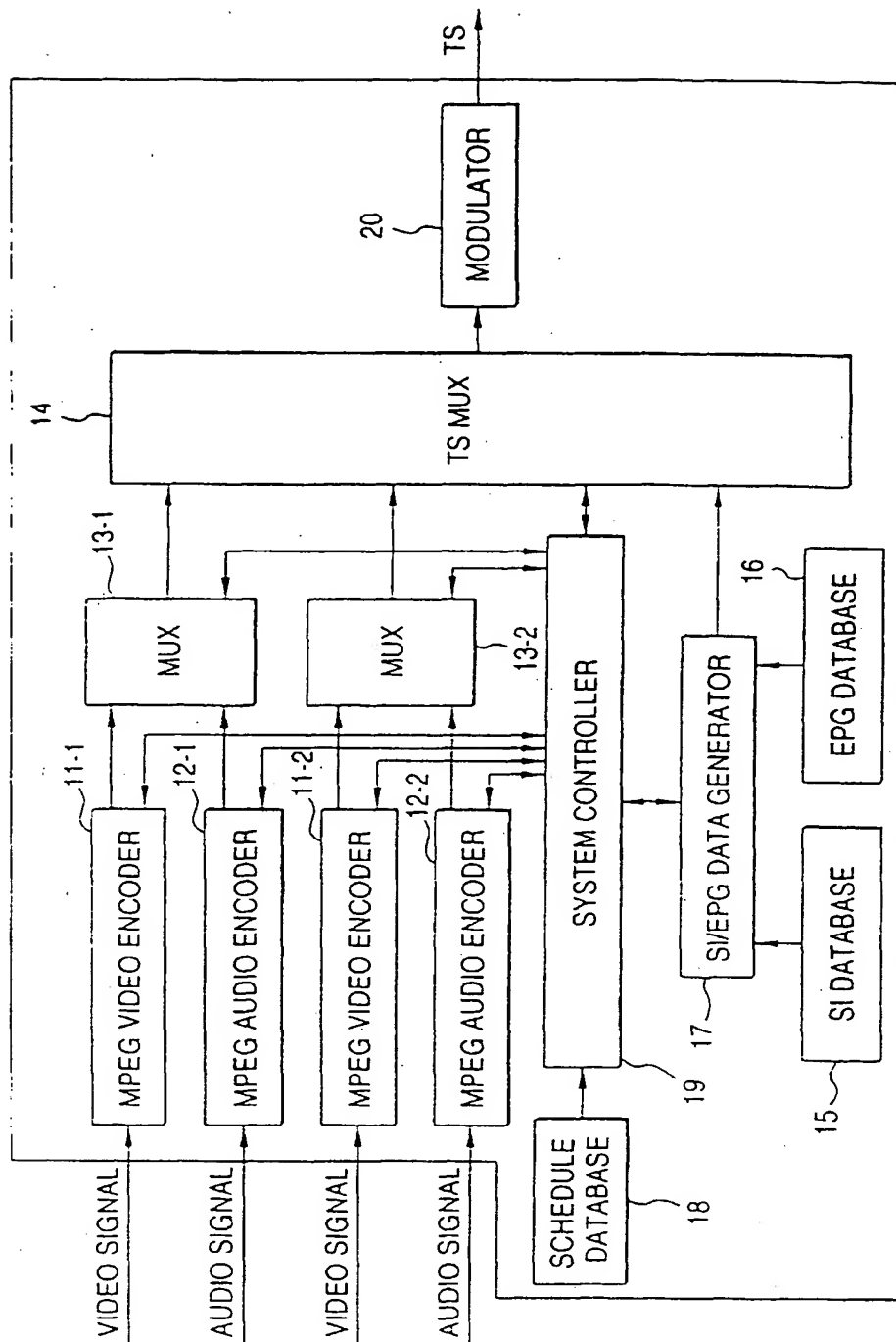


FIG. 4

KIND OF PROGRAM INFORMATION		TABLE_ID	RE-TRANSMISSION CYCLE (Sec)	TRANSMISSION RATE (kbps)
PROGRAM INFORMATION OF SELF STATION	CURRENT, NEXT	0X4E	3	1
	WITHIN 6 HOURS FROM PRESENT TIME	0X50	5	5
	6-24 HOURS AWAY	0X51	10	10
	2-3 DAYS AWAY	0X52	20	10
	4-8 DAYS AWAY	0X53	30	30
PROGRAM INFORMATION OF ANOTHER STATION	CURRENT, NEXT	0X4F	3	10
	WITHIN 6 HOURS FROM PRESENT TIME	0X60	5	30
	6-24 HOURS AWAY	0X61	10	64
	2-3 DAYS AWAY	0X62	20	60
	4-8 DAYS AWAY	0X63	30	120
TOTAL				330

FIG. 5

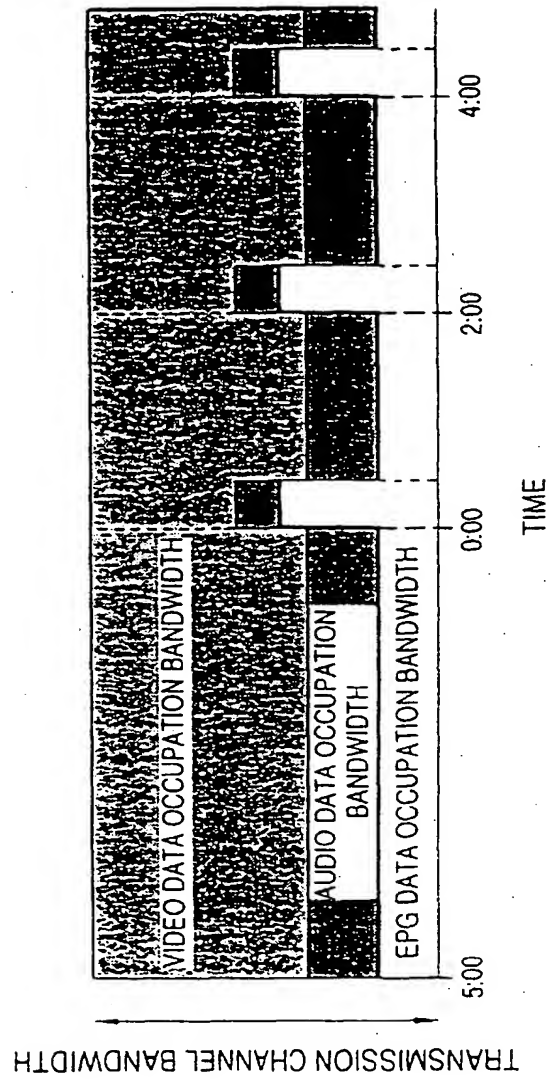


FIG. 6

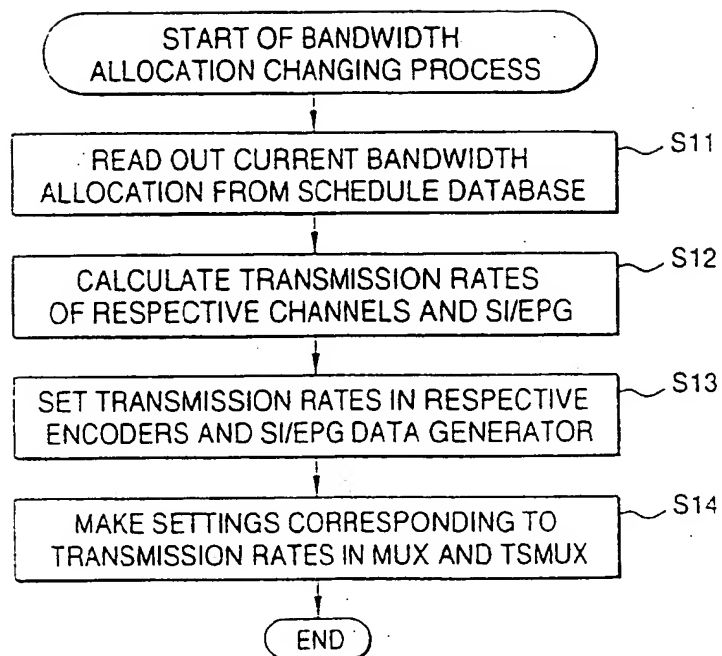


FIG. 7

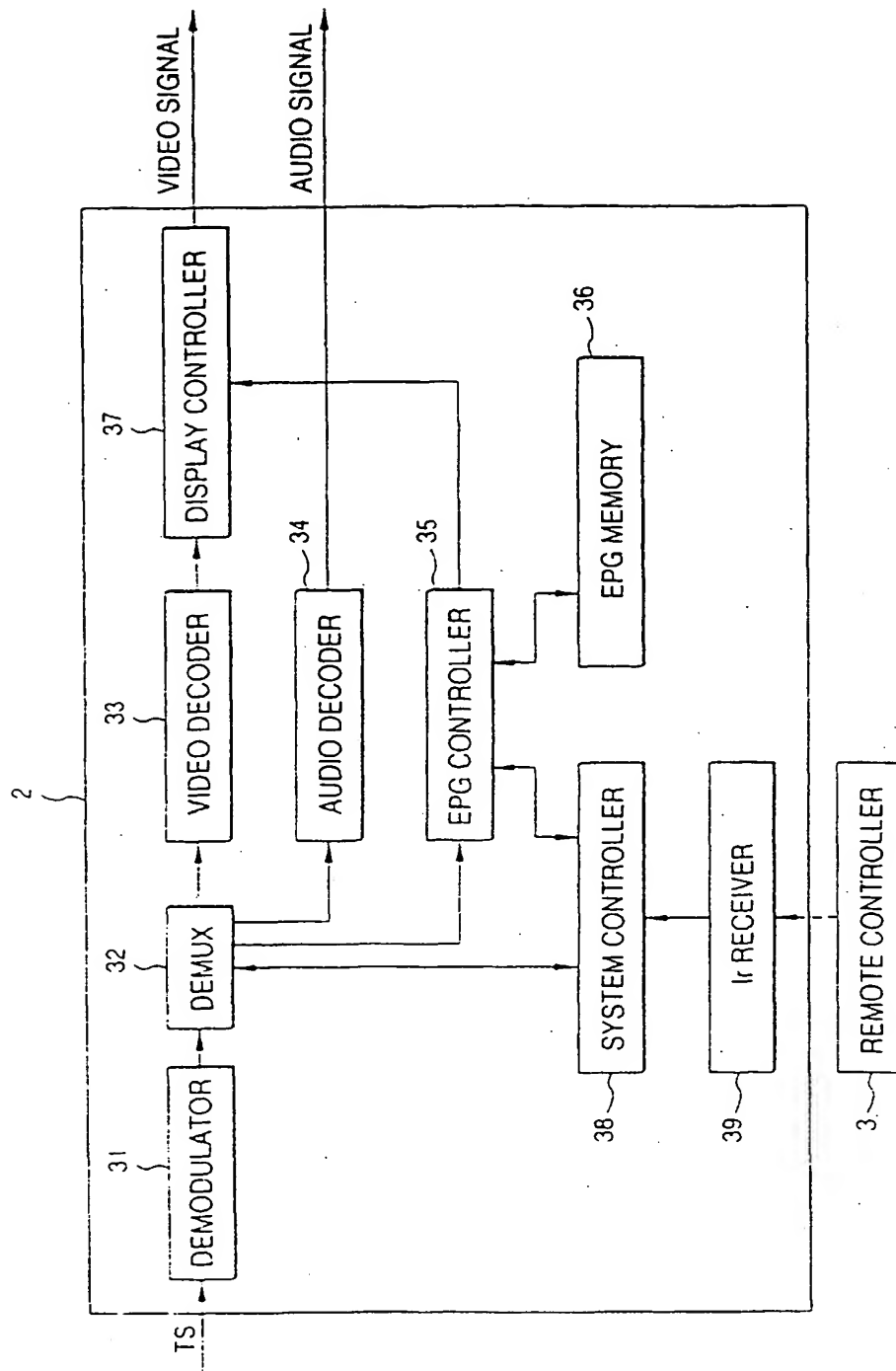


FIG. 8

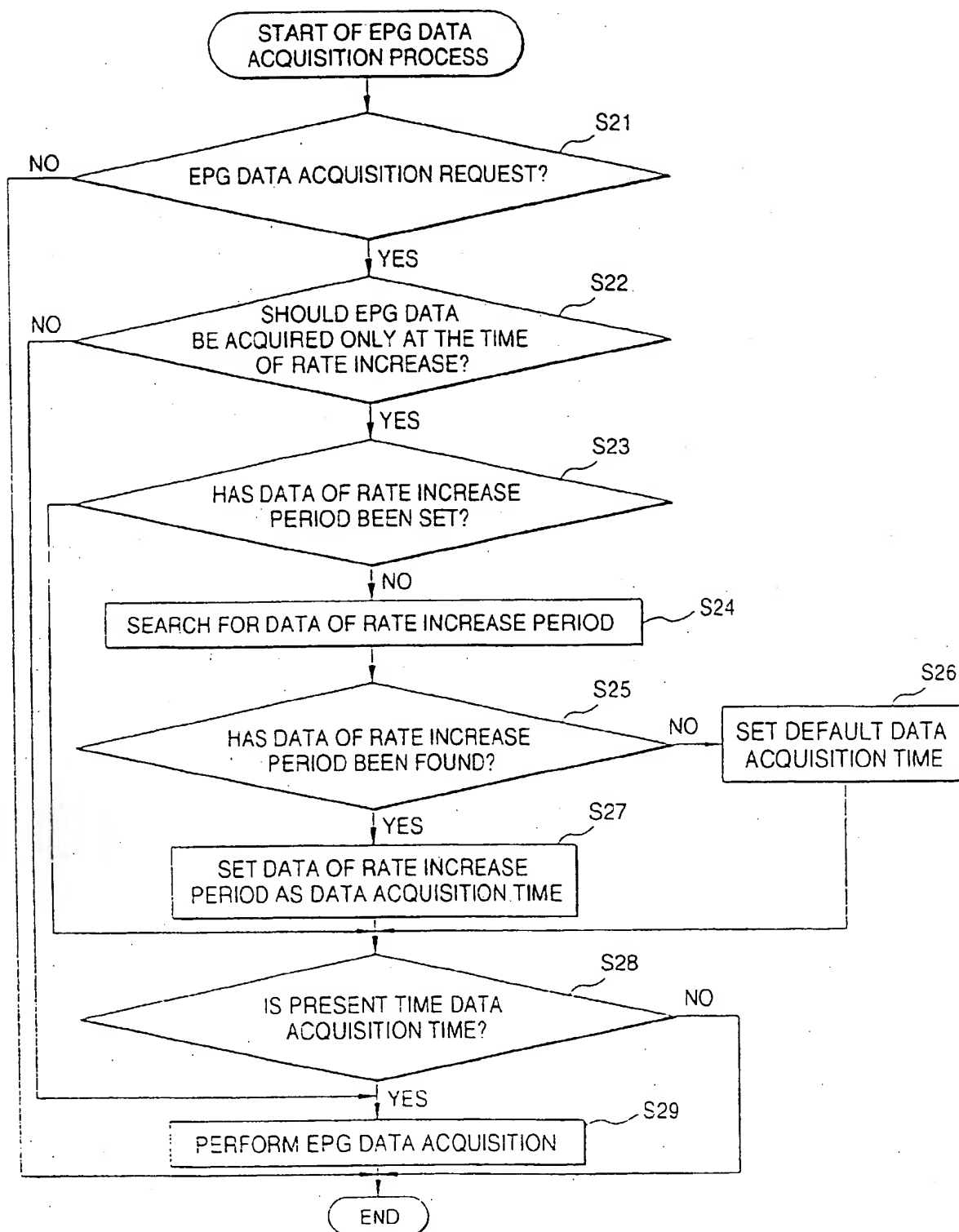


FIG. 9

SYNTAX	NUMBER OF BITS	MNEMONIC
event_information () {		
table_id	8	uimsbf
section_syntax_indicator	1	bslbf
reserved_future_use	1	bslbf
reserved	2	bslbf
section_length	12	uimsbf
service_id	16	uimsbf
reserved	2	bslbf
version_number	5	uimsbf
current_next_indicator	1	bslbf
section_number	8	uimsbf
last_section_number	8	uimsbf
transport_stream_id	16	uimsbf
original_network_id	16	uimsbf
segment_last_section_number	8	uimsbf
last_table_id	8	uimsbf
for (i=0; i<N; i++) {		
event_id	16	uimsbf
start_time	40	bslbf
duration	24	uimsbf
running_status	3	uimsbf
free_CA_mode	1	bslbf
descriptors_loop_length	12	uimsbf
for (i=0; i<N; i++) {		
}		
}		
CRC_32	32	rpchof
}		

FIG. 10

```

data_length
for ( i=0 ; i < data_length ; i++ ) {
    table_id
    status_flag
    version_number
}
    8 bit  table_id of eit to be described
           (formal drawing: table_id of eit to be described)
    1 bit  status of eit indicated by above table_id
    5 bit  version of eit indicated by above table_id

```

FIG. 11

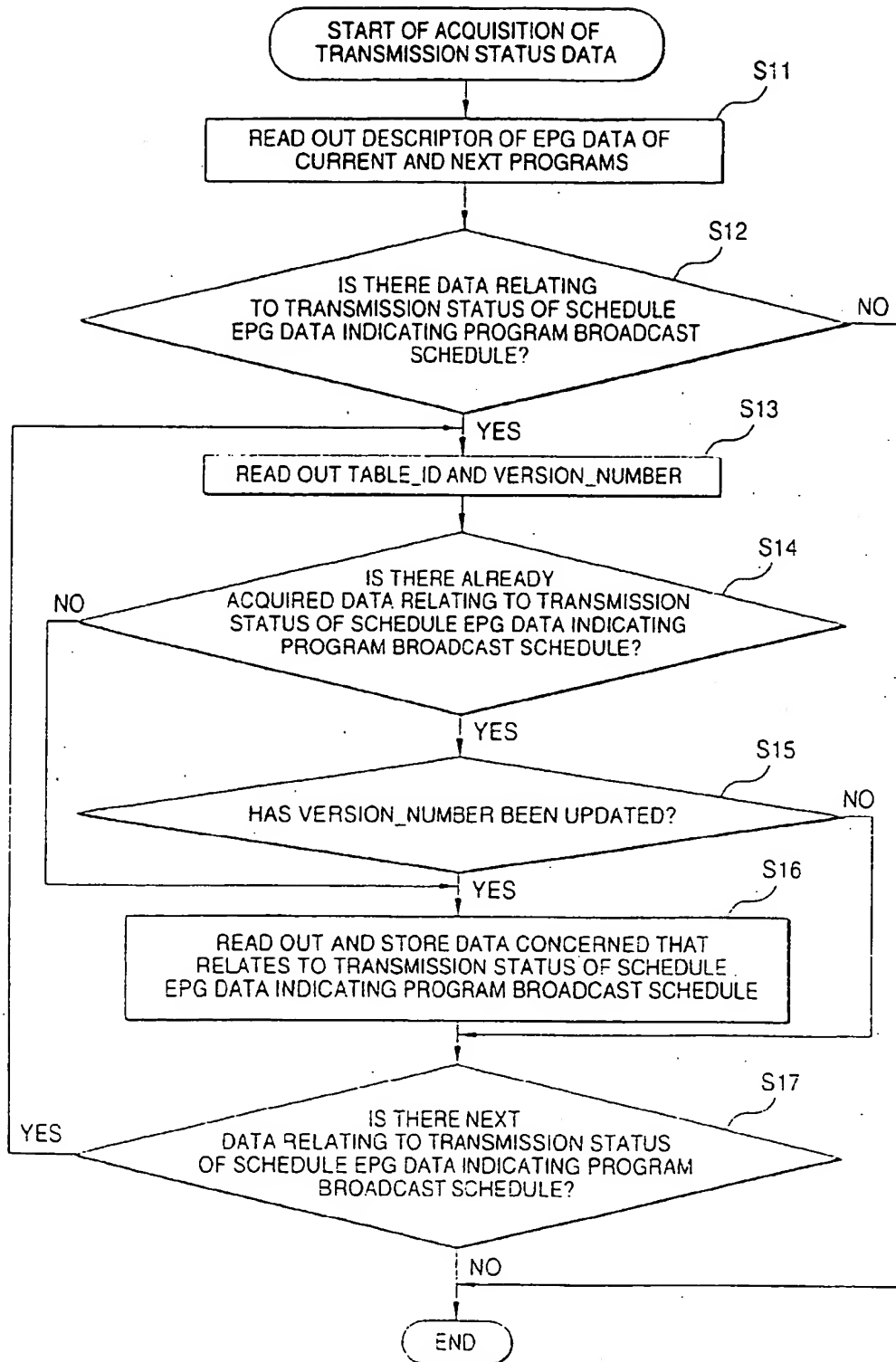


FIG. 12

SYNTAX	NUMBER OF BITS	MNEMONIC
table_information_section () {		
table_id	8	uimbsf
section_syntax_indicator	1	bslbf
reserved_future_use	1	bslbf
reserved	2	bslbf
section_length	12	uimbsf
service_id	16	uimbsf
reserved	2	bslbf
version_number	5	uimbsf
current_next_indicator	1	bslbf
section_number	8	uimbsf
last_section_number	8	uimbsf
transport_stream_id	16	uimbsf
original_network_id	16	uimbsf
segment_last_section_number	8	uimbsf
last_table_id	8	uimbsf
for (i=0; i<N; i++) {		
table_id	8	uimbsf
repeating_rate	16	bslbf
update_time	40	bslbf
status_flag	1	bslbf
reserved_future_use	3	bslbf
descriptors_loop_length	12	uimbsf
for (i=0; i<N; i++) {		
descriptor ()		
}		
}		
CRC_32	32	rpchof
}		

(19)



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(11)

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(12)

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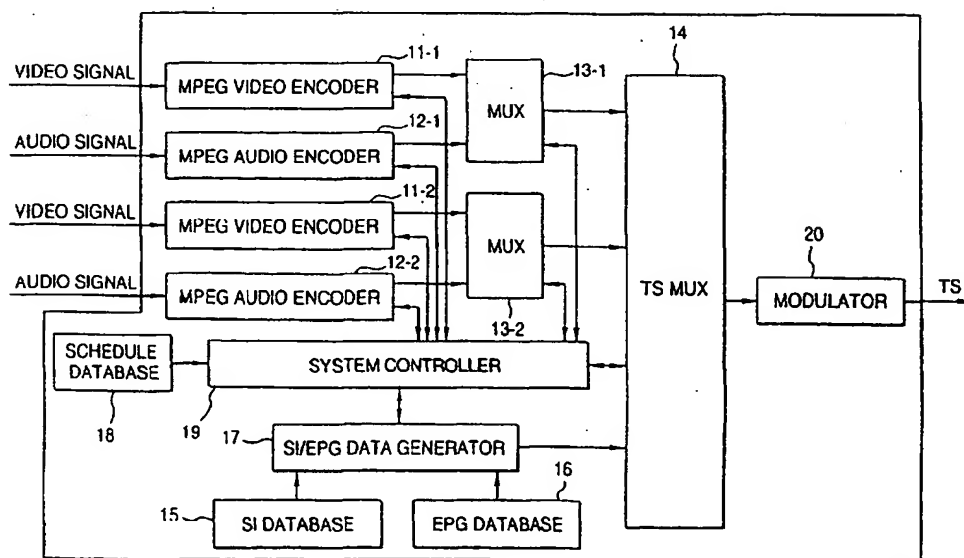
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(54) **Information transmitting apparatus and method, information receiving apparatus and method, apparatus for providing a computer readable program, and broadcasting system**

(57) MPEG video encoders and MPEG audio encoders encode video signals and audio signals, respectively. An SI/EPG data generator generates program in-

formation. A transport stream multiplexer multiplexes the program information with video data and audio data. A system controller controls the data output rates of the encoding operations and the multiplexing ratio.

FIG. 3**EP 0 966 164 A3**



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 4701

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Place of search MUNICH		Date of completion of the search 5 March 2003	Examiner Luckett, P
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document</p> <p>T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document</p>			

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EUROPEAN SEARCH REPORT

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			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 5 March 2003	Examiner Luckett, P
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